BEET (*Beta vulgaris*)
WILD BEET (*Beta vulgaris* ssp. *maritima*)
Rhizoctonia root rot; *Rhizoctonia solani*

Hanson, L.E. and L. Panella
USDA-ARS, Sugarbeet Research Unit
Crops Research Lab
1701 Centre Ave.; Fort Collins, CO 80526-2083

Rhizoctonia root rot resistance of *Beta* PIs from the USDA-ARS NPGS, 2002.

Thirty Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) (Garden Beet, Sugar Beet, Leaf Beet, Fodder Beet, and wild beet) were evaluated for resistance to Rhizoctonia root rot. The trial was conducted as a randomized, complete-block design. One-row plots, replicated five times were planted at the Crops Research Lab-Fort Collins Research Farm, CO, on 23 May. Plots were 4.5 m long with 56 cm between rows and 20 to 25 cm within-row spacing. Inoculation with dry, ground, barley-grain inoculum of *Rhizoctonia solani* isolate R-9 (AG 2-2) was performed on 17 Jul; immediately after inoculation, a cultivation was performed to throw soil into the beet crowns. The field was thinned by hand and irrigated as necessary. Beets were harvested 3 through 6 Sept. Each root was rated for rot on a scale of 0 (no damage) to 7 (dead). Analyses of variance (PROC GLM - SAS) were performed on disease indices (DIs), percent healthy roots (undamaged classes 0 and 1 combined), and percentage of roots in classes 0 thru 3 (those most likely to be harvested and taken to the factory). Percentages were transformed using arcsin-square root to normalize the data for analyses ("AP 0-1" and "AP 0-3" in the accompanying table). Both percentages and transformations are presented in the table.

Temperatures were high in the summer of 2002 and the field had a moderate inoculum load. The root rot epidemic progressed quickly, becoming severe by the beginning of September. Differences in DIs among entries were highly significant ($P < 0.001$). Mean DIs across all tests in the 2002 nursery for highly resistant FC705-1, resistant FC703, and highly susceptible FC901/C817 controls were 1.89, 2.24, and 4.40 respectively. Percentages of healthy roots were 39.3, 35.9, and 10.0% for these controls. Percentages of roots in disease classes 0 thru 3 were 91.2, 86.3, and 37.1%, respectively. The highest and lowest DIs for the evaluated lines were 6.5 and 1.3, respectively. The highest and lowest DIs for the PI accessions were 6.78 and 3.13 respectively. Four PIs (518644, 535831, 546522 & 590695) had DIs significantly lower than the susceptible control. Three of the above PIs had a significantly higher percent of roots rated 0 - 3 and one had a significantly higher percent of healthy roots than the susceptible control. In addition, three of these PIs (518644, 535831, & 546522) had a percent of roots rated 0 - 3 that was not significantly different from the resistant control.

Entry	Seed Source	subspecies	Donor's ID	DI	% 0-1[1]	% 0-3[1]	AP 0-1[1]	AP 0-3[1]
771	PI 504181	*vulgaris*	Wild leaf beet	6.47	0.00	0.00	0.0	0.0
772	PI 504269	*maritima*	Wild beet	5.62	0.00	14.25	0.0	15.9
773	PI 504277	*maritima*	Wild beet	6.08	0.00	7.50	0.0	11.3
774	PI 504279	*maritima*	Wild beet	4.63	2.50	37.75	4.6	37.4
775	PI 518168	*vulgaris*	IDBBNR 9600	4.69	8.60	16.40	8.2	15.4
776	PI 518331	*maritima*	IDBBNR 5825	5.32	0.00	34.00	0.0	32.3
777	PI 518404	*maritima*	IDBBNR 5898	4.75	0.00	31.25	0.0	30.0
778	PI 518644	*vulgaris*	IDBBNR 9604	3.48	6.25	63.75	7.5	57.1
779	PI 518645	*vulgaris*	IDBBNR 9605	4.28	2.80	45.00	4.4	41.7
780	PI 535830	*vulgaris*	POLY PAST	4.67	0.00	44.33	0.0	41.7
781	PI 535831	*vulgaris*	TYTAN POLY	3.13	2.60	77.00	4.2	64.6
782	PI 614823	*vulgaris*	IDBBNR 9507	5.78	0.00	7.00	0.0	10.8
783	PI 540557	*B. macrocarpa*	WB 820	5.19	0.00	19.20	0.0	22.7
784	PI 540592	*maritima*	WB 846	6.02	0.00	12.80	0.0	16.1
785	PI 540615	*maritima*	WB 869	6.78	0.00	0.00	0.0	0.0
786	PI 540637	*maritima*	WB 891	6.12	2.60	7.80	0.0	10.4
787	PI 540640	*maritima*	WB 894	6.67	0.00	0.00	0.0	0.0
788	PI 540641	*maritima*	WB 895	6.26	0.00	14.40	0.0	19.6
789	PI 540652	*maritima*	WB 906	5.33	0.00	29.00	0.0	29.3
790	PI 540661	*maritima*	WB 915	5.77	0.00	6.40	0.0	9.1
791	PI 540665	*maritima*	WB 919	6.64	0.00	6.25	0.0	7.5
792	PI 540690	*maritima*	WB 944	6.39	0.00	0.00	0.0	0.0
793	PI 540692	*maritima*	WB 946	5.99	0.00	15.60	0.0	15.0
794	PI 546504	*vulgaris*	TURKESTANSKAJA	4.72	0.00	39.00	0.0	33.3
795	PI 546522	*maritima*	IDBBNR 9689	3.23	3.00	79.67	5.8	67.7
796	PI 590695	*vulgaris*	IDBBNR 4360	3.16	10.00	61.00	14.1	51.7
797	PI 611060	*vulgaris*	Swiss chard	3.85	0.00	49.00	0.0	44.5
798	PI 614824	*vulgaris*	Jaltuskovskaja 116	5.26	0.00	9.20	0.0	13.5
799	PI 614825	*vulgaris*	AT3984A	5.13	0.00	17.50	0.0	21.6
800	PI 614827	*vulgaris*	AT3993-4	4.13	2.80	35.40	4.4	33.1
801	941025	*vulgaris*	Susceptible Check - FC901/C817	4.90	2.00	24.60	3.7	26.6
802	831083	*vulgaris*	FC705/1 - 'Highly Resistant Check	1.90	32.00	100.00	34.3	90.0
803	751080H	*vulgaris*	FC703 - 'Resistant Check	1.97	34.60	91.60	35.6	79.5
			$LSD_{P=0.05}$	1.3			8.9	25.4
Trial Mean				4.97	3.29	29.87	3.9	28.6

[1] DI = Disease Index on a scale of 0 (no damage) to 7 (plant death), % 0-1= percent healthy roots, % 0-3 those roots most likely to be harvested and taken to the factory. AP is the arcsin-square root transformation of percentages to normalize the data for analyses.